CLAIMS: I claim:

1. A method for heating a medium, said medium comprising hydrocarbonaceous material, comprising:
   (a) subjecting said medium to an alternating current electrical field generated by a radio frequency waveform applied at a predetermined frequency range that heats said medium;
   (b) measuring an effective load impedance initially dependent upon the impedance of said medium;
   (c) comparing said effective load impedance with an output impedance of a signal generating unit that generates said radio frequency waveform; and
   (d) automatically adjusting said effective load impedance to match an output impedance of said signal generating unit.

2. The method of claim 1 wherein said output impedance of said signal generating unit is a predetermined constant.

3. The method of claim 2 wherein said output impedance of said signal generating unit is about 50 ohms.

4. The method of claim 1 wherein measuring said effective load impedance includes measuring a voltage across said medium and measuring a resulting electric field developed in said medium.

5. The method of claim 1 wherein measuring said effective load impedance includes measuring a current of said radio frequency waveform applied to the medium.

6. The method of claim 1 wherein measuring said effective load impedance includes

measuring a voltage and a current of said radio frequency waveform applied to said medium, and determining a phase angle based on the measured voltage and measured current.

7. The method of claim 1 wherein measuring said effective load impedance includes measuring a forward power level of said radio frequency waveform applied to generate a voltage across and current through said medium and a reverse power level of said radio frequency waveform reflected from an effective load.

8. The method of claim 7, further comprising calculating a voltage standing wave ratio from said forward power level and said reverse power level.

9. The method of claim 8, further comprising repeating the act of automatically adjusting said effective load impedance until said voltage standing wave ratio is about 2:1 or less.

10. The method of claim 8, further comprising repeating the act of automatically adjusting said effective load impedance until said voltage standing wave ratio is about 1:1.

11. The method of claim 1 wherein automatically adjusting said load impedance to said output impedance of said signal generating unit includes adjusting said selected frequency of said applied radio frequency waveform.

12. The method of claim 1 wherein automatically adjusting said effective load impedance to match said output impedance of said signal generating unit includes tuning a tunable impedance matching network connected to an effective load.

13. The method of claim 1, further comprising periodically measuring at least one temperature of said medium during heating, and using said measured temperature in automatically adjusting said effective load impedance to match said output impedance of said signal generating unit.

14. The method of claim 1 wherein of said radio frequency waveform allows for a wavelength to be at least ten times greater than a longest geometrical dimension of the medium under test.

15. The method of claim 1 wherein said selected frequency of said radio frequency waveform is in a range of 1 mhz to 300 mhz.

16. The method of claim 1 wherein said hydrocarbonaceous matter in said medium is contained in a subterranean environment.

17. The method of claim 1 wherein said medium is of hydrocarbonaceous matter, and of said radio frequency waveform is greater than about 30 mhz.

18. The method of claim 1, further comprising exposing said medium to a subterranean reservoir of a carrier medium, said carrier medium being a fluid which allows radio frequency waves to travel to said medium.

19. The method of claim 18 wherein said medium is heated while exposed to said reservoir of said carrier medium.

20. The method of claim 18 wherein said medium that is generally adjacent to said reservoir is heated, said carrier medium in said reservoir being maintained at a temperature range below boiling point of said carrier medium.

21. The method of claim 1 wherein a desired compound within said medium forms a recoverable layer within said reservoir, and said recoverable layer can be extracted from said reservoir.

22. A method for heating a hydrocarbon-bearing formation, comprising:

(a) subjecting said hydrocarbon-bearing formation to an alternating current field produced by applying a radio frequency waveform at a predetermined variable frequency with a signal generating unit, said signal generating unit having a generally constant output impedance;

(b) measuring an actual impedance of said hydrocarbon-bearing formation;

(c) determining an effective load impedance, said effective load impedance initially dependent upon said actual impedance of said hydrocarbon-bearing formation, said effective load impedance being determined by at least one of measuring a voltage and current of an applied radio frequency waveform and computing a phase angle difference, and measuring a forward power level of said radio frequency waveform applied to said hydrocarbonaceous matter and a reverse power level of said radio frequency waveform reflected from said hydrocarbon-bearing formation with circuitry of said signal generating unit;

(d) comparing said effective load impedance with said output impedance of said signal generating unit; and

(e) automatically matching said effective load impedance to said output impedance of said signal generating unit by at least one of adjusting the frequency at which said radio frequency waveform is applied and tuning a tunable impedance matching network such that said effective adjusted load impedance is approximately equal to said output

impedance of signal generating unit.

23. A method for heating a hydrocarbon-bearing formation, comprising:

maintaining a hydrocarbonaceous matter in an alternating current electrical field generated by a radio frequency waveform at a frequency not greater than 300 mhz provided by a signal generating circuitry, said hyrdrocarbonaceous matter originating from said hydrocarbon-bearing formation and being contained in a subterranean reservoir; and

controllably heating said hydrocarbonaceous matter by automatically maintaining an impedance match between said hydrocarbonaceous matter and a signal generating circuitry, said signal generating circuitry providing said radio frequency waveform.

24. A method for heating a hydrocarbon-bearing formation, comprising:

maintaining at least one hydrocarbonaceous compound within a subterranean environment and in an alternating current electrical field, said electrical field provided by a radio frequency waveform, said hydrocarbonaceous compound originating from said hydrocarbon-bearing formation;

periodically sensing an impedance of said hydrocarbonaceous compound and undesired organic and inorganic compositions to produce a sensor output signal;

determining impedance mismatch based on a difference between a most recently sensed impedance and a known impedance, and generating a corresponding control signal output that corresponds to said difference with a computer; and

as said hydrocarbonaceous compound and undesired organic and inorganic compositions increase in temperature, adjusting said frequency of said radio frequency waveform by said control signal output of said computer such that said impedance matches said most recently sensed impedance.

25. A method of separating a hydrocarbonaceous matter from undesired matter commonly

associated with a hydrocarbonaceous formation, comprising:

maintaining hydrocarbonaceous matter and undesired matter in an alternating current electrical field provided by a radio frequency waveform, said hydrocarbonaceous formation being exposed to a subterranean reservoir, said reservoir comprising a fluid carrier medium, said fluid carrier medium allowing passage of said radio frequency waveforms to penetrate and heat said hydrocarbonaceous formation;

periodically sensing an impedance of said hydrocarbonaceous matter and said fluid carrier medium to produce a sensor output signal;

determining an impedance mismatch based on a difference between a most recently sensed impedance and a known impedance, and generating a corresponding control signal output that corresponds to said difference with a computer; and,

as said hydrocarbonaceous matter and said fluid carrier medium increase in temperature, adjusting said frequency of said radio frequency waveform by said control signal output of said computer such that said sensed impedance matches said most recently sensed impedance, such that said hydrocarbonaceous matter will rise in temperature and decrease in viscosity, and thus rise to the surface of said reservoir and dropping out said undesired matter to settle as sediment in said reservoir.

26. A method for heating a hydrocarbon-bearing formation, comprising:

testing a first sample of a hydrocarbonaceous material to determine a first impedance of at least one targeted chemical composition at several different temperatures;

storing a resulting impedance vs. temperature information for said targeted chemical composition in a memory of a computer;

flowing a signal through a second sample of said hydrocarbonaceous material, said signal being at a radio frequency not greater than 300 mhz for said targeted chemical compositions;

sensing a second impedance of at least one portion of a second sample;

determining, by operation of said computer, a relationship between a most recently sensed impedance of said hydrocarbonaceous material and a heating rate of said targeted chemical compositions; and

adjusting a heating rate of said targeted chemical composition based on said relationship.

27. A method for heating specific chemical compositions that reside in hydrocarbonaceous material, comprising:

maintaining hydrocarbonaceous material in an alternating current electrical field provided by a radio frequency signal at a frequency not greater than 300 mhz; and

controllably heating said hydrocarbonaceous material by automatically maintaining an impedance match between an impedance of said hydrocarbonaceous material and a predetermined constant, said predetermined constant comprising an optional fluid carrier medium (for example, water, a saline solution, carbon dioxide), which can be unaffected, when desired, by the frequencies being presented to the target elements within the formation